On A Testable Unification Of Electromagnetics, General Relativity, And Quantum Mechanics

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Abstract

Unrecognized for what it was, in 1903-1904 E.T. Whittaker (W) published a fundamental, engineerable theory of electrogravitation (EG) in two profound papers. The first (W-1903) demonstrated a hidden bidirectional EM wave structure in the scalar potential of vacuum, and showed how to produce a standing scalar EM potential wave -- the same wave discovered experimentally four years earlier by Nikola Tesla. W-1903 is a hidden variable theory that shows how to deterministically curve the local and/or distant space-time using EM. W-1904 shows that all force field EM can be replaced by interferometry of two scalar potentials, anticipating the Aharonov-Bohm effect by 55 years and extending it to the engineerable macroscopic world. W-1903 shows how to turn EM into G-potential, curve local and/or distant space-time, and directly engineer the virtual particle flux of vacuum. W-1904 shows how to turn G-potential and curvature of space-time back into force-field EM, even at a distance. The papers implement Sakharov's 1968 statement that gravitation is not a fundamental field of nature, but a conglomerate of other fields. Separately applied to electromagnetics (EM), quantum mechanics (QM), and general relativity (GR), an extended superset of each results. The three supersets are Whittaker-unified, so that a testable, engineerable, unified field theory is generated. EM, QM, and GR each contained a fundamental error that blocked unification, and these three errors are explained. The Schroedinger potential can also be structured and altered, indicating the direct engineering of physical quantum change. Recently Ignatovich has pointed out this hidden bidirectional EM wave structure in the Schroedinger potential, without referencing Whittaker's 1903 discovery of the basic effect. The potential for applying the new approach to explain the nature of mind and thought, and providing a laboratory-testable theory for them, is briefly noted and indicative major references cited. Some of the possible implications for physics and biology are pointed out.

Electromagnetics Has Foundations Difficulties

There exists today a small but growing number of scientists who have become aware that the presently accepted electromagnetic theory is seriously flawed. Shortcomings in the theory are readily cited.

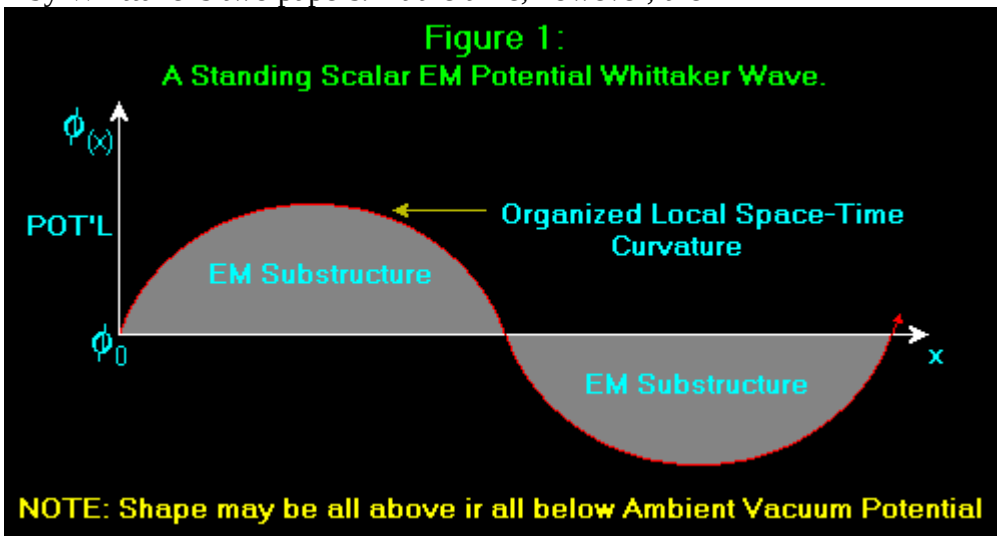
For example, in railgun experiments the Lorentz force law has been falsified. It was always an approximation, and does not adequately approximate at high energies.[Ref 1]

Also completely contrary to orthodox EM theory, the EM force fields are not primary agents at all, but are effects produced in and on the physical system by the potentials. As an example, we cite the Aharonov-Bohm (AB) effect, which proves that, even in the total absence of the force fields, the potentials remain and can interfere at a distance to produce real effects in charged particle systems.[Ref 2] The AB effect has been proven to the satisfaction of all but the most diehard skeptics.[Ref 3] However, its fundamental impact on the basic notions underlying classical EM theory continues to be ignored by all but a handful of scientists.

These EM shortcomings were not present in the original *quaternion* EM theory by James Clerk Maxwell.[Ref 4] Indeed, the original Maxwell theory contains many things that were mistakenly eliminated from the abbreviated vector theory formulated primarily by Heaviside and Gibbs, and to a lesser extent by Hertz.[Ref 5] Further, these things that do not exist in conventional EM theory, but that exist in Maxwell's actual quaternion theory, can be used in specially designed equipment, and the operation of that equipment will be inexplicable by present-day electromagnetic theory. AB-effect laboratory apparatuses are in fact rigorous demonstrations of such a statement.

Scalar Electromagnetics

This can be even further explained and developed experimentally according to Whittaker's fundamental approach.[Ref 6] In a modern sense, in 1903/1904 Whittaker theoretically showed how to engineer the scalar potential with a highly dynamic, hidden, bidirectional EM wave structure, to build hidden EM *vacuum engines* that are still unsuspected in modern physics today. Much of the content of the fundamental 1959 Aharonov/Bohm paper was anticipated in a different manner -- and dramatically extended in an engineerable, testable fashion -- by Whittaker's two papers. At the time, however, the



vector interpretation of Maxwell's EM theory was just slowly beginning to spread as the adopted model. Also, special and general relativity and quantum mechanics had not yet been born. Accordingly, considering the scientific understanding of the day, it was not possible for any scientist -- even Whittaker himself -- to perceive the potential future impact these fundamental papers could have on sciences and technologies not yet even born. Unfortunately, in later years Whittaker apparently never realized that his two earlier papers had such application to the modern unification problem. Indeed, up to the time of Whittaker's death, very few scientists even concerned themselves with the notion of unified fields.

Turning EM Energy Into G-Potential Energy

In his 1903 paper Whittaker showed that a standing scalar potential wave can be decomposed into a special set of bidirectional EM waves that convolute into a standing scalar potential wave, as shown in Figure 1. As a corollary, a set of bidirectional EM waves -- stress waves -- can be constructed to form a standing scalar potential wave in space, as shown in Figure 2. Since all potentials represent

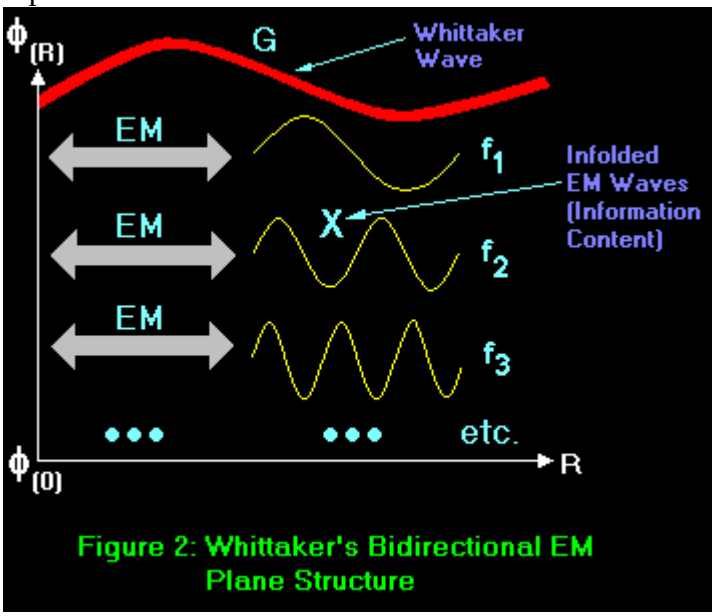


Figure 2: Whittaker's Bidirectional EM Plane Structure

trapped energy density of vacuum, they are gravitational in nature.[Ref 7] Because it represents a "standing wave" whose magnitude represents the variation in the local energy density of the vacuum, the Whittaker scalar potential wave represents a standing wave of variation in the *local curvature* of vacuum, sharply in contradiction to the assumptions of present electromagnetics and general relativity.[Ref 8] It also represents a standing wave of the variation of the local gauge.

Turning G-Potential Back to EM

The very next year, Whittaker's second paper (cited above) showed how to turn such G-potential wave energy back into EM energy, even at a distance, by scalar potential interferometry, anticipating and greatly expanding the Aharonov-Bohm effect. Indeed, Whittaker's second paper shows that the entire present force-field electromagnetics can be directly replaced with scalar potential interferometry. In other words, scalar EM includes and extends the present restricted vector subset of Maxwell's original theory.

Engineering the Nucleus Directly

Whittaker's work is even more striking when one realizes that potentials are actually part of the vacuum itself. They pervade through the electron shells of an atom, directly reaching the nucleus and centering on it. Gross external changes (gradients; force fields) of the potentials interact primarily with the electron shells of the atom. The stabilized (persistent, gradient-free) potential's primary interaction is with the atomic nucleus. Specifically, the primary interaction between the infolded, internalized EM bidirectional wave structure of a Whittaker potential is with the atomic nuclei, rather than with the atom's electron shells, because in the standing Whittaker potential wave the local magnitude of the external potential is not changing. Whittaker has in fact shown that there exists an unsuspected, hidden, *internal* EM

energy exchange channel between nuclei -- a channel where EM energy flows bidirectionally, undetected by most modern detectors. Unlimited types of Whittaker-structures can be produced in the laboratory in the form of deterministically structured potentials; for the first time, the direct engineering, structuring, and manipulation of the nuclear potentials themselves, even with miniscule EM power, is possible. This is a new capability of exceptional importance and application. The Whittaker structuring in effect allows one to produce a "virtual grid" to place in the violent virtual particle flux (VPF) exchange of the local vacuum with the nucleus. By simply holding the grid signal constant, gradually the nuclear potential itself will substructure (*activate*) with the same structure. When the activating ("charging") potential is removed, the activation of the nucleus will gradually "decay" back to the normal structure. Just as one example, the binding energy of an atomic nucleus is accessible and -- theoretically -- engineerable.

Whittaker Structuring Confirmed

Recently Ignatovich has pointed out the hidden bidirectional EM wave structure in the Schroedinger potential, without referencing Whittaker's 1903 discovery of the basic effect.[Ref 9] Also, recently modern researchers, working on acoustic missiles and with the scalar acoustic wave equation, have "rediscovered" Whittaker's 1903 infolded bidirectional planar waves inside the scalar wave.[Ref 10] They do not appear to have yet recognized its relevance to their work in electromagnetic missiles.[Ref 11]

Stochastic Electrodynamics

Whittaker's paper takes on a significant new meaning, however, in light of Sakharov's 1968 hypothesis that gravitation is not a primary field, but is produced as a result of interactions of other fields. Together with Whittaker's structured potential, this implies that the *gravitational* aspects of the nucleus can also be electromagnetically engineered. As a result of Sakharov's hypothesis, explosive activity in stochastic electrodynamics (SED) has shown that many fundamental parts of physics are "already unified" in terms of electromagnetics and gravitation. Evidence continues to accumulate that the gravitational field may not be a primary field of nature, but a secondary or residual effect associated with other non-gravitational fields.[Ref 12] Actually, general relativity has always focused on energy as the thing which really has gravitation. Trapped energy, such as mass, is particularly important. But since mass is essentially trapped EM energy, relativity has essentially assumed Sakharov's hypothesis anyway, without stating it so explicitly. Further, GR considers "the" G-potential as a conglomerate of other things.[Ref 13] It follows that the gradient of that conglomerate yields a force field which is also a conglomerate.

G-Potential is Electromagnetic

Starting from Sakharov's postulate, to the first order gravitation should be due to some aspect of the EM field, since EM is the strongest and most universal force normally encountered in the macroscopic world experimentally, and since mass is already "trapped EM energy." Thus Sakharov focused attention upon the zero-point EM energy fluctuations (ZPF) of vacuum. Sakharov conjectured that the Lagrange function of the G-field is generated by vacuum polarization, due to fermions.[Ref 14] Akama et al examined the potential generation of gravity as a collective excitation of fermion-antifermion pairs.[Ref 15] Haxlacher and Mottolo proved that space-time (ST) curvature can arise from the quantum fluctuations of pure gauge fields.[Ref 16] Zee showed that gravity is generated as a symmetry-breaking effect in

quantum field theory in which a dynamical scale-invariance breaking is postulated to take place at energies near the Planck mass.[Ref 17] Amati, Veneziano and Yoshimoto showed that in pre-geometric models the Einstein action and metric may be generated from quantum fluctuations of matter fields.[Ref 18] A review of the exploding field was given by Adler, with particular emphasis on the case of renormalizable field theories with dynamical scale-invariance breaking, in which the induced gravitational effective action is finite and calculable.[Ref 19]

Puthoff's Important Contribution

Recently Puthoff has applied the Sakharov viewpoint to significantly advance the stochastic electrodynamics field. He has successfully explained why the atom's orbital electrons do not decay into the nucleus, even though by conventional EM theory each electron must constantly radiate EM energy, since it is constantly accelerated.[Ref 20] He has also shown that gravitation can indeed be regarded as an induced effect associated with zero-point EM fluctuations of the vacuum.[Ref 21] He has also shown a feedback-derivation of the source of the vacuum EM zero-point energy fluctuations from quantum fluctuation motion of particles driven by the ZPE.[Ref 22] Quantum fluctuation motion of particles and vacuum ZPE fluctuations are connected by a causal, self-regenerating cosmological feedback cycle.

Some Conclusions

In light of Whittaker's EM structuring of the potential, there are several important conclusions to be taken from the important SED work since Sakharov's seminal suggestion, as follows: (1) In stochastic electrodynamics, very solid theoretical foundation exists for electrogravitation. (2) The vacuum EM ZPF may be regarded as causally connected to quantum mechanical particle jitter (Zitterbewegung motion) and vice versa, though the feedback mechanism into the virtual particle flux of vacuum is normally hidden by the large-scale integration represented by any macroscopic object or process. (3) The SED theoretical demonstration of this hidden mechanism adds new emphasis on the rather neglected hidden variable theories. (4) In some fashion, statistical quantum change is chaotic rather than random, for it has already been shown by Puthoff that the vacuum ZPF fluctuations driving everything are totally deterministic. It follows that, theoretically, hidden Whittaker order already exists in quantum change, and quantum change must be already chaotic and at least partially deterministic. (5) It follows that there may well exist engineerable mechanisms that can affect or manipulate quantum change.

Whittaker Potentials Are Engineerable

What Whittaker has described in his 1903 paper is a standing electrogravitational wave -- a standing wave in the local curvature of space-time itself -- that can readily be constructed experimentally. This Whittaker standing potential wave is precisely the new form of standing EM wave that Nikola Tesla had experimentally discovered being radiated from a thunderstorm four years earlier, on the night of July 3-4, 1899, and which he recorded in his Colorado Springs Notebook on the morning of July 4, 1899.[Ref 23] Further, Whittaker's paper directly implies that the hidden variable determinism shown by Puthoff to be driving the zero-point EM fluctuations can also be engineered, both locally and at a distance.

In short, Whittaker's 1903 paper shows how to turn electromagnetics into gravitational potential. Unknowingly, Whittaker had already shown the correct engineering way to unify EM and G fields, and already falsified one of Einstein's later primary GR assumptions -- that

the local space-time is never curved -- in a testable manner, a decade before Einstein published his theory of general relativity.

In the very next year, 1904, Whittaker's second paper (orally presented in 1903) was published.[Ref 24] In this little-noticed paper Whittaker shows that all classical force field electromagnetics can be replaced by scalar EM potentials and their interferometry. Specifically, any EM force field can be replaced by two scalar potential fields and scalar interferometry. The combination of this paper and the 1903 Mathematische Annalen paper not only includes the Aharonov-Bohm effect, but specifies a testable method for producing a macroscopic and controlled Aharanov-Bohm effect, even at large distances.[Ref 25]

Present Electromagnetic Theory Is Incomplete

As stated above, Maxwell's original EM theory was written in quaternions, which are an extension to the complex number theory and an independent system of mathematics. In short, since the quaternion is a hypernumber, Maxwell's theory was a hyperspatial theory -- not just the limited three-dimensional subset that was extracted and expressed by Heaviside and Gibbs in terms of an abbreviated, incomplete vector mathematics.[Ref 26]

Heaviside and Gibbs Curtailed Maxwell's Theory

Oliver Heaviside was a brilliant, self-taught genius who never formally attained a university degree, and whose papers were printed in technical magazines rather than scientific journals. When Maxwell published his Treatise in 1873, Heaviside was just teaching himself differential equations. Heaviside's imagination was completely seized by Maxwell's book, and Maxwell forever became his hero. However, he had great difficulty with quaternions and could not completely tolerate them.

Electrogravitation Was Discarded

A puzzled Heaviside abhorred the quaternion, since it linked together a scalar component and a vector component -- or "apples and oranges," in his view. He excised the scalar component of the quaternion and excluded the hyperspatial characteristics of its directional components -- producing his much more limited vectors. To unite magnetics and electromagnetics, the simplest complex aspect of the quaternion had to be restored by resorting to ordinary imaginary numbers. These machinations to the quaternion theory, however, discarded its unified field theory aspects. In short, Heaviside produced a very practical, highly restricted subset that was far easier to engineer, but he threw out electrogravitation in the process.

Hatred of the Potential

Heaviside hated the potential because he did not truly understand it. He stated that it was "...mystical and should be murdered from the theory." He conditioned generations of physicists and engineers to erroneously believe that the potential was just a mathematical convenience, and had no actual physical realization. Indeed, most electrical physicists and electrical engineers are still of that erroneous persuasion today, even though the Aharonov-Bohm work has long-since falsified such a position, both theoretically and experimentally.

The Quaternion Theory Was Already a Unified EM/G Theory

The present author has previously pointed out that Maxwell's quaternion theory was in fact a unified theory of electromagnetics and gravitation, and that the scalar component of the quaternion was the electrogravitational part.[Ref 27] That part was discarded by Heaviside and Gibbs, and so electrogravitation no longer appears in the electromagnetics that resulted from Heaviside's and Gibbs' surgery on Maxwell's quaternion theory. Strong experimental evidence for the EG nature of Whittaker's scalar EM theory is planned for presentation at this conference.[Ref 28]

Electrogravitation Also Excluded From General Relativity

The electrogravitational effect was also erroneously excluded from Einsteinian general relativity (GR). Einstein unwittingly narrowed his general relativity to only a subset of an unrestricted general relativity of curved space-time, by excluding local curvature. This GR error was an indirect result of the fundamental Heaviside/Gibbs omission error in classical electromagnetics.

Einstein's Gedankenexperiment

Unfortunately, Einstein's view of electromagnetics approximated the classical Heaviside/Gibbs view. In classical EM theory, the electrical potentials -- which actually were *electrogravitational* potentials -- were already ignored as having no physical significance, and EM was considered mutually exclusive to G. Therefore, Einstein only considered the weak gravitational force due to the attraction of mass, in developing his general relativity theory of curved space-time. The G-force is far weaker than the E-force; for two electrons, for example, the attractive G-force between them is on the order of only 1.0E-42 times as strong as their electrical E-force repulsion. Thus the G-force is incredibly smaller than the EM force. If only the weak G-force is considered for curving space-time, then there will never be an observable curvature except in the immediate vicinity of a very large mass, such as on the surface of the sun or near a star.

Considering the weak G-force as the agent for curvature, Einstein reasoned that the laboratory and the observer/scientist/instrument would never be on the surface of the sun or near a star. Therefore, the local space-time -- where the lab and the scientist/observer and his instruments are -- would never be observably curved. The local space-time of the observer would always be flat.

Unfortunately Einstein then overgeneralized his thought examination, and he stated one of his fundamental postulates of general relativity as "The local space-time is always flat." This is an erroneous overstatement. The postulate should be more correctly stated as follows: "The local space-time is always flat, whenever only the weak gravitational force is used for the agent of curvature, and the observer is not near a large collection of mass, such as a star."

Corollary to the Corrected Postulate

The two statements of the postulate differ fundamentally. Einstein's overstatement of the postulate does not allow the far stronger EM force to be used as an agent for local curvature. In effect, his own postulate excluded electromagnetics from curvature unity with gravitation, in his general relativity theory.[Ref 29] On the other hand, the corrected statement of the postulate admits the following corollary: "When a very strong force such as the electromagnetic force is used for the agent of curvature, the local space-time may be curved, even though the observer is not near a large collection of mass, such as a star."[Ref 30]

Regrettably, many of Einstein's modern followers have raised Einstein's theory to a dogma, and have vigorously enforced his overstatement of the locally flat space-time.[Ref 31] In so doing, general relativity has been erroneously reduced to a theory that is basically not experimental: A priori, if the local space-time is flat, then there is no local experiment or local apparatus that involves or yields a curved space-time where the laboratory, the instruments, and the observer are located. In this fashion the universities have continued to perpetuate the exclusion of electrogravitation and its direct space-time curvature engineering implications.

The Curtailment Of Quantum Mechanics

Today, quantum mechanics is our most successful physics theory. Its predictions -- even the eery prediction of action at a distance -- have been proven time and time again. However, quantum mechanics theory is known to have a formidable foundations difficulty: Try as they will, quantum physicists cannot find *chaos* in the theory. The theory is known to be wrong unless it possesses chaos (hidden order inside its statistics), yet the best efforts of quantum physicists have failed to find it.[Ref 32]

Chaos Excluded By Inherent Assumption

Any well-founded mathematical discipline is totally implied by its foundations postulates, and that is true of quantum mechanics. If the best efforts of the ablest physicists of the day cannot find chaos in the present QM, then one may suspect that the present QM does not *contain* chaos (hidden order), but already *excludes* it in some fashion. If that is true, then some present QM postulate -- either explicit or implicit -- of QM must be the culprit. If so, the "real" QM needed is a superset that has at least two subsets: one (the missing) subset includes chaos, while the present subset excludes chaos. So we may suspect that one or more of the postulates of the present QM theory is in error or overly restrictive, and must be changed to allow the missing chaotic subset.

Gibbs Statistics Excludes Hidden Order

Indeed, we may resolve this formidable QM problem quite simply by examining the statistics utilized by quantum mechanics. When QM was being formulated, scientists simply appropriated and included the thermodynamic statistics of Willard Gibbs (the same Gibbs who, together with Heaviside, was responsible for the highly restricted vector subset of Maxwell's theory of electromagnetics). Gibbs' thermodynamics statistics was totally based on the notion of the random variable. That is, the change (value assumed by the variable in a specific instance) is not only totally statistical, it is also totally *random*. Quantum physicists assumed a postulate of QM as follows: "Quantum change is totally statistical." However, because of the Gibbs statistics, in application they interpreted that postulate in a much stronger fashion, as if it had been stated thusly: "Quantum change is totally statistical and random." The actual postulate and the presently applied interpretation of it are in fact two quite different statements, and the interpretation is far more restrictive than actually implied by the postulate itself.

The Random Interpretation Is False

Further, the strong interpretation can readily be falsified. As an example, the macroscopic universe is simply a large integration (collection) of quantum changes. If these component quanta occur totally randomly, then no integration of them would yield the ordered, macroscopic world we all live in, because integrated randomness is still random. Therefore,

since the ordered macroworld exists, the present QM strong interpretation of its own statistical quantum change postulate is invalid.

In addition, if quantum change were totally random, then there would never be any possibility, a priori, of engineering it deterministically. Presently, almost all quantum physicists believe that quantum change cannot be engineered, on first principles. On the other hand, if hidden order is admitted, there is at least the possibility of directly engineering physical quantum change itself.

Hidden Variables

Interestingly, the renowned physicist David Bohm has shown that a hidden variable theory of quantum mechanics can actually be constructed, whereby one could potentially engineer physical change.[Ref 33] It is well-known that experimental physics does not in any manner refute hidden variable theories. Because of the historical attachment of physics to the theory of the random variable, such contrary notions as chaos (hidden order) and hidden variables have simply been greeted with suspicion and shuffled aside. The usual objection is Occam's razor; a theory must predict something different, or it is said to be unwarranted.[Ref 34] But based on this same form of Occam's overworked razor, the Whittaker hidden variable approach certainly predicts many profoundly different engineerable effects and capabilities that mandate its full examination.

Correction of the Statistical Postulate

A much better, valid interpretation of the quantum change postulate is as follows: "Quantum change is statistical, and may contain hidden order."

The two interpretations differ sharply. In the new and less restrictive reinterpretation, one has three cases or subsets of QM as follows: (1) the subset where quantum change contains partial order, hence is already chaotic, (2) the subset where the internal order has vanished, leaving the statistics as Gibbs' random variable statistics, and exhibiting the present quantum mechanics without chaos, and (3) the subset where the statistics is totally deterministic, but information on the variables is lost.

Remarks On the New Interpretation

The new interpretation is consistent with Bohm's hidden variable theory, and it is also consistent with the Schroedinger equation, which in the QM model already propagates the QM states forward in time with absolute determinism. It is even possible, for example, to deterministically produce a Bohm/de Broglie *quantum potential*, according to a self-targeting repetitive phase conjugation mechanism advanced by this author.[Ref 35] The new interpretation is not consistent with the Copenhagen interpretation, which only applies to the present QM subset. This can be seen as follows: If quantum change is engineerable by Whittaker hidden variables, then the inner contents of the engineered quantum change are known. This knowledge applies to the subset where QM change is engineered (the new subset), but not to the subset where all variables are random variables and hence not subject to engineering. Therefore the Copenhagen interpretation applies to the random quantum change subset, but not to chaotic (partially ordered) quantum change subset.

The New Interpretation Is Testable

Happily, the reinterpretation of the postulate now allows a sufficient collection of already-chaotic quantum changes to produce the well-ordered, macroscopic universe we all live in. Also, the new interpretation is testable, and it can be falsified or verified in the laboratory.

The End Result Of Abbreviating Maxwell's TheoryEffect On EM

In discarding the scalar component of the quaternion, Heaviside and Gibbs unwittingly discarded the unified EM/G portion of Maxwell's theory that arises when the translational/directional components of two interacting quaternions reduce to zero, but the scalar resultant remains and infolds a deterministic, dynamic structure that is a function of oppositive directional/translational components. In the infolding of EM energy inside a scalar potential, a structured scalar potential results, almost precisely as later shown by Whittaker but unnoticed by the scientific community. The simple vector equations produced by Heaviside and Gibbs captured only that subset of Maxwell's theory where EM and gravitation are mutually exclusive. In that subset, electromagnetic circuits and equipment will not ever, and cannot ever, produce gravitational or inertial effects in materials and equipments. Not a single one of those Heaviside/Gibbs equations ever appeared in a paper or book by James Clerk Maxwell, even though the severely restricted Heaviside/Gibbs interpretation is universally and erroneously taught in all Western universities as Maxwell's theory.

Effect On GR

As a result of this artificial restriction of Maxwell's theory, Einstein also inadvertently restricted his theory of general relativity, forever preventing the unification of electromagnetics and relativity. He also essentially prevented the present restricted general relativity from ever becoming an experimental, engineerable science on the laboratory bench, since a hidden internalized electromagnetics causing a deterministically structured local space-time curvature was excluded.

Effect On QM

Quantum mechanics used only the Heaviside/Gibbs externalized electromagnetics and completely missed Maxwell's internalized and ordered electromagnetics enfolded inside a structured scalar potential. Accordingly, QM maintained its Gibbs statistics of quantum change, which is non-chaotic a priori. Quantum physicists by and largely excluded Bohm's hidden variable theory, which conceivably could have offered the potential of engineering quantum change -- engineering physical reality itself.

In Summary

Each of the three major scientific disciplines missed and excluded a subset of its disciplinary area, because it did not have the scalar component of the quaternion to incorporate. Further, all of them completely missed the significance of the Whittaker approach, which already shows how to apply and engineer the very subsets they had excluded.

What now exist in these areas are three inconsistent disciplines. Each of them unwittingly excluded a vital part of its discipline, which was the unified field part. Ironically, then, present physicists continue to exert great effort to find the missing key to unification of the three disciplines, but find it hopeless, because these special subsets are already contradictory to one another, as is quite well-known to foundations physicists.

Conclusions

Obviously, if one wishes to unify physics, one must add back the unintentionally excluded, unifying subsets to each discipline.

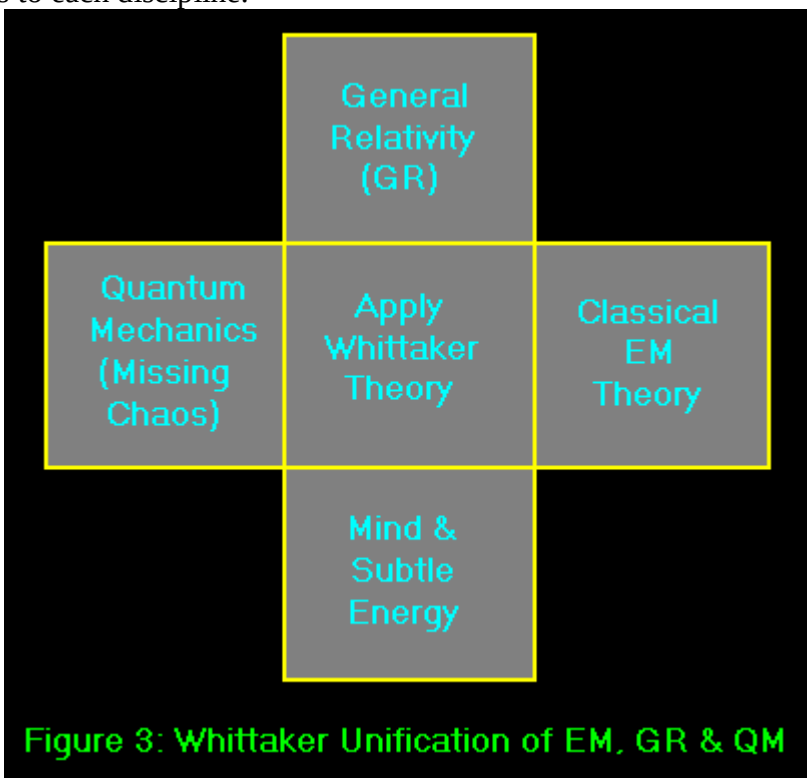


Figure 3: Whittaker Unification of EM, GR & QM

Interestingly, all three needed subsets turn out to be one and the same, as shown in Figure 3. So application of Whittaker's work to each one of the three disciplines produces the necessary superset of each, and these three supersets are unified in and on the common added Whittaker subset.

Also, as shown in the figure, one gets an added and unexpected bonus of great value: Mind, thought, and life occupy time, and if time is treated as a real dimension, then these are real also. Since fundamental units in which physics is modeled are arbitrary, one can even model physics in terms of one unit, time. In that case, everything is a time structure. Since even physical reality can be viewed in this fashion, it is not unreasonable to view mind, thought, and life as real; they do after all occupy time. However, since they do not emerge in the normal external electromagnetics, they must lie within the hidden, internal electromagnetics (since the photon carries both time and energy, being a piece of action). Without further development, we state that the Whittaker hidden variable EM approach, in allowing the complete engineering of the internal electromagnetics, allows the complete engineering of mind, thought, and life. Living systems have utilized the internal EM Whittaker channel (in and through atomic nuclear potentials and area quantum potentials) since the beginning.[Ref 36]

Finally, the Whittaker unification linkage of the three disciplines is testable. It is engineerable. It works.

Notes And References

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"Electrodynamic Explosions in Liquids," Appl. Phys. Lett., Vol. 46, 1985, p. 468; R. Azevedo, P. Graneau, P.N. Graneau, and C. Millet, "Powerful Water Plasma Explosions," Phys. Lett. Vol. 117, 1986, p. 101.

2. See Y. Aharonov and D. Bohm, "Significance of Electromagnetic Potentials in the Quantum Theory," Phys. Rev. Second Series, 115(3), Aug. 1, 1959, p. 458-491. This paper pointed out the primacy of the potentials. Instead of being causative agents, the force fields are actually *effects* generated in and of charged particle systems from the potentials. This is in complete violation of both classical electromagnetics and classical dynamics, but it is absolutely required by quantum mechanics. For an extensive discussion of the Aharonov-Bohm effect and an extensive list of references, see S. Olariu and I. Iovitzu Popescu, "The Quantum Effects of Electromagnetic Fluxes," Rev. Mod. Phys. 57(2), Apr. 1985.
3. See Bertram Schwarzschild, "Currents in normal-metal rings exhibit Aharonov-Bohm Effect," Physics Today, 39(1), Jan. 1986, p. 17-20 for confirmation.
4. James Clerk Maxwell, A Treatise on Electricity and Magnetism, Oxford University Press, Oxford, 1873. The third edition is published by Dover, 1954.
5. Maxwell's true theory of electromagnetics is contained in some 200-odd quaternion equations, and is far more complex than the gross vector simplification developed by Heaviside and Gibbs after Maxwell's death. For a cogent argument about what might have been discovered much earlier in physics if quaternions had not been cast aside, see James D. Edmonds, Jr., "Quaternion Quantum Theory: New Physics or Number Mysticism?", Am. J. Phys., 42(3), Mar. 1974, p. 220-223. Just how much more powerful was Maxwell's quaternionic expression of EM theory than was Heaviside's (i.e., the modern) vector interpretation, was succinctly expressed by Josephs as follows: "Hamilton's algebra of quaternions, unlike Heaviside's algebra of vectors, is not a mere abbreviated mode of expressing Cartesian analysis, but is an independent branch of mathematics with its own rules of operation and its own special theorems. A quaternion is, in fact, a generalized or hypercomplex number..." (H.J. Josephs, "The Heaviside Papers Found at Paignton in 1957," Electromagnetic Theory by Oliver Heaviside, Including an account of Heaviside's unpublished notes for a fourth volume, and with a foreword by Sir Edmund Whittaker, Vol. III, Third Edition, Chelsea Publishing Co., New York, 1971, p. 660.)
6. See E.T. Whittaker, "On the Partial Differential Equations of Mathematical Physics," Math. Ann., Vol. 57, 1903, p. 333-355; "On an Expression of the Electromagnetic Field Due to Electrons by Means of Two Scalar Potential Functions," Proc. Lond. Math. Soc., Series 2, Vol.1, 1904, p. 367-372.
7. In the modern view, it is trapped energy that is gravitational, mass being viewed as simply such trapped energy. We point out that Einstein's formula $E = mc^2$ actually is an expression for mass in terms of its trapped EM energy. Thus we extend the modern view by stating that, to first order, Newtonian gravitational attraction is due to the attraction of spatially entrapped electromagnetic energy. Since the electromagnetic scalar potentials represent just such spatially entrapped EM energy, then they hold a special significance gravitationally.
8. This assertion can be tested. At the nodal points of the standing potential wave, the rate of flow of time is normal. At nonzero points along the wave, however, the local rate of flow of local time varies from normal. After a proper-time

interval for the observer at the nodal point, normal clocks and watches at different non-nodal points along the wave will appreciably vary in their time reading. Initially synchronized clocks will thus be found to disagree, if placed in different positions in the Whittaker wave and allowed to remain for a test period. In the past, various inventors have anecdotally demonstrated this effect. As an example, see David Jones, Vancouver Sun Times, Dec. 17, 1977, p. 17.
9. V.K. Ignatovich, "The Remarkable Capabilities of Recursive Relations," Am. J. Phys., 57(10), Oct. 1989, p. 873-878.
10. Richard W. Ziolkowski, "Localized transmission of wave energy," Proc. SPIE, Vol. 1061, Microwave and Particle Beam Sources and Directed Energy Concepts, Jan. 1989, p. 396-397.
11. An acoustic missile is essentially a slug of acoustic energy that holds together as it travels, striking and damaging or destroying a target. An electromagnetic missile is a slug of EM energy that holds together as it travels to a target and strikes it.
12. A.D. Sakharov, "Vacuum Quantum Fluctuations in Curved Space and the Theory of Gravitation," Sov. Phys. Dokl., Vol. 12, 1968, p. 1040. See also the related discussion in Misner, Thorne and Wheeler, Gravitation, 1973, p. 426.
13. Note that this assigns an internal structure to a gravitational potential.
14. A.D. Sakharov, Theor. Math. Phys., Vol. 23, 1975, p. 435.
15. K. Akama et al, Prog. Theor. Phys., Vol. 60, 1978, p. 868.
16. B. Hasslacher and E. Mottolo, Phys. Lett., Vol. 95B, 1980, p. 237.
17. A. Zee, Phys. Rev. Lett., Vol. 42, 1979, p. 417.
18. D. Amati and G. Veneziano, Phys. Lett., Vol. 105B, 1981, p. 358; S. Yoshimoto, Prog. Theor. Phys., Vol. 78, 1987, p. 435.
19. S. Adler, Rev. Mod. Phys., Vol. 54, 1982, p. 729.
20. H.E. Puthoff, "Ground State of Hydrogen as a Zero-Point-Fluctuation-Determined State," Phys. Rev. D, 35(10), May 15, 1987, p. 3266-3269.
21. H.E. Puthoff, "Gravity as a Zero-Point-Fluctuation Force," Phys. Rev. A., 39(5), Mar. 1, 1989, p. 2333-2342. See also H.E. Puthoff, "Source of Vacuum electromagnetic Zero-Point Energy," Phys. Rev. A., 40(9), Nov. 1, 1989, p. 4857-4862. Changing the vacuum potential constitutes a fluctuation directly in and of the zero-point energy of vacuum, and hence, by Puthoff's mechanism, it does indeed induce a gravitational effect. At the level of the vacuum virtual particle flux exchange with the charged nucleus, producing an electromagnetic change also produces a gravitational change, and vice-versa.
22. Puthoff, Phys. Rev. D., 35(10), May 15, 1987, p. 3266-3269.
23. Nikola Tesla, Colorado Springs Notes 1899-1900, Nolit, Belgrade, Yugoslavia, 1978, p. 61-62.
24. E.T. Whittaker, "On an Expression of the Electromagnetic Field Due to Electrons by Means of Two Scalar Potential Functions," Proc. Lond. Math. Soc., Series 2, Vol. 1, 1904, p. 367-372.
25. The potential for weaponization of the Whittaker work should be obvious.
26. Toward the end of his life Heaviside lived as a recluse in a small garret apartment, and may have returned again to his struggle with quaternions. In the 1950's handwritten notes of a theory of gravitation, written in quaternion mathematics, were found beneath the floor boards of his tiny study.
27. T.E. Bearden, "Maxwell's Original Quaternion Theory Was a Unified Field Theory of Electromagnetics and Electrogravitation," Proceedings, International Tesla Society Symposium, Colorado Springs, Colorado, July 1988. See also T.E. Bearden, "Maxwell's Lost Unified Field Theory of Electromagnetics and

Gravitation," Proceedings, PACE Third International New Energy Technology Symposium, June 25-28, 1988 at Maison du Citoyen, Hull (Ottawa), Canada, 1988.

28. See Floyd Sweet and T.E. Bearden, "Utilizing Scalar Electromagnetics to Tap Vacuum Energy," Proceedings, this conference.
29. Ironically, Einstein then spent the remainder of his life, desperately trying to unify electromagnetics and gravitation in his theory of general relativity, never realizing that his own overstatement of his "flat local space-time" postulate precluded his success and foredoomed all his efforts to failure.
30. To appreciate just what can actually be done with local spacetime curvature, see E.B. Smetanin, "Electromagnetic Field in a Space With Curvature -- New Solutions," Sov. Phys. J., 25(2), Feb. 1982, p. 107-111.
31. For a detailed exposition of the scientific suppression used to uphold the present GR, written by an inside scientist of excellent ability, and one with over 100 published papers in the literature, see Rugero Maria Santilli, Ethical Probe on Einstein's Followers in the USA: An Insider's View, Alpha Publishing, POB 82, Newtonville, MA 02160, 1984.
32. For a discussion of the missing chaos in quantum mechanics, see Robert Pool, "Quantum Chaos: Enigma Wrapped in a Mystery," Science, 243(4893), Feb. 17, 1989, p. 893-895. For a more technical discussion see P.V. Elyutin, "The Quantum Chaos Problem," Sov. Phys. Usp. 31(7), July 1988, p. 597-622.
33. For an entry point into the literature of hidden variable theory, see Quantum Implications: Essays in Honour of David Bohm, B.J. Hiley and F. David Peat, Eds., Routledge & Kegan Paul, London & New York, 1987.
34. However, even if it predicts something new and is warranted, it still may not be adopted. An example is the continuing reluctance of physicists to reformulate EM theory, stressing the primacy of the potential and the fact that not the force field but only the potential for the force field exists in the vacuum. Even more so, it is well-known that detection is actually binary, and we throw away precisely half of almost every detection our instruments make. C.f. Richard Kidd et al, "Evolution of the Modern Photon," Am. J. Phys., 57(1), Jan. 1989, p. 27-35. Generally in every electromagnetic interaction of our instruments, two photons are produced: one a time-forward photon, and the other a time-reversed photon. Our detectors essentially measure the time-forward photon half, not the time-reversed photon (antiphoton) half. The antiphoton half produces a slight recoil force (Newton's third law reaction force) in the mass (nuclei) of the instrument, which we ignore. Also, we continue to ignore the evidence that the photon and antiphoton are not identical. In a pumped phase conjugate mirror, for example, the emission of a normal photon from the mirror material results in a recoil of the mirror; the emission of an antiphoton by the mirror material, however, does not result in recoil of the mirror. Physics is still not consistent, as is well-known to foundations researchers, but this fact is generally not accented to university students.
35. Bearden, Gravitobiology, Tesla Book Co., 1991, p. 33-36. The mechanism was previously advanced in several miscellaneous papers and in private correspondence.
36. See Bearden, Gravitobiology, Tesla Book Co., for additional development of biological effects and mechanisms of scalar EM.